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Date: January 21, 2021

Mr. Charlie Zielinski  
New Jersey Department of Environmental Protection  
Bureau of Case Management  
P.O. Box 420, Mail Code 401-05F  
401 East State Street  
Trenton, NJ 08625

**RE: Response to NJDEP Comments  
Revised Ecological Risk Assessment Report, EEZs 1, 2, 7, 8, 10,  
and 14, dated March 26, 2019  
Bayway Refinery Complex  
1400 Park Ave.  
Linden, Union County, NJ  
SRP PI# 008282, Activity Number: RPC000002**

Dear Mr. Zielinski:

ExxonMobil Environmental & Property Solutions (ExxonMobil) has prepared this response letter to address the New Jersey Department of Environmental Protection (NJDEP or Department) comments received on the EEZs 1, 2, 7, 8, 10, and 14 Revised Ecological Risk Assessment Report (RERAR) submitted on March 26, 2019 for the Bayway Refinery Complex (BRC) in Linden, New Jersey. A comment letter from the NJDEP was received on April 16, 2020. ExxonMobil's responses presented in this letter have been prepared consistent with discussions during the meetings with NJDEP personnel on October 26, 2020 and December 10, 2020.

The comments in the April 16, 2020 NJDEP letter are primarily focused on the ecological risk assessment (ERA) of Moses Creek, and in some cases have a bearing on other Investigative Area of Concerns (IAOCs) incorporated into that assessment. The NJDEP and ExxonMobil have had an ongoing dialogue on this ERA since 2012. ERA activities began well before that, as summarized in the following list of documents:

- Baseline Ecological Evaluations (EEs) prepared by A.D. Little (1998) and AMEC (2005, 2006);
- Ecological Remedial Investigation Work Plan (2012);
- Ecological Remedial Investigation (ERIR), including Anchor QEA Sediment Analysis of Product (2014);
- ERA Work Plan (2014) and Addendum (TRC, 2016);
- Superior Court of Union County Consent Judgment (2015);
- ERA WP Approval (2016);
- Ecological Risk Assessment Report (ERAR) and Final ERAR (TRC, 2017);
- Reference Area Supplemental Sampling and Analysis Work Plan (TRC, 2018);
- Revised ERAR (RERAR) (TRC, 2018);

- NJDEP Approval of BRC Remediation Strategy Road Map (2018);
- Final Revised ERAR (TRC, March 2019); and
- NJDEP Comments on RERAR (April 2020).

In addition to the ERA activities presented documents listed above, there have been numerous meetings and discussions between ExxonMobil and NJDEP in which general concurrence was reached in many aspects of the ERA approach. A summary of the factors that form the basis for the ERA approach are provided below.

1. Selection of the final remedy and remediation for Morses Creek is deferred as agreed between the NJDEP and ExxonMobil, and as set forth in the Consent Judgment approved in the matter of New Jersey Department of Environmental Protection v. Exxon Mobil Corporation, Docket No. UNN-L-3026-04, consolidated with UNN-L-1650-05; *"the final remedy determination and remediation for Morses Creek will be deferred until the cessation of refining operations at the BRC site, which will be when operational conditions at the BRC no longer require the regular discharge into Morses Creek of 30 million gallons per day or more of once-through non-contact cooling water pursuant to NJPDES Permit No. NJ0001511 (or as renewed/reissued)."*
2. The Consent Judgment requires preparation of a Feasibility Study Report (FSR) that will evaluate potential remedial action alternatives. Because site conditions, regulations, guidance and policies governing a future risk management decision are all likely to change in the decades before the refinery ceases to operate at 30 million gallons per day (mgd) once-through non-contact cooling water, the FSR will evaluate a full range of alternatives from No-Action to complete remediation of Morses Creek.
3. State regulations do not provide guidance for preparation of a FSR, but the 1991 Administrative Consent Order Appendix E included an outline for what items need to be addressed. A FSR would normally be based on a risk management decision reflecting current conditions that represent a snapshot in time. As a result, it is very likely the ERA will require re-evaluation in the future after the refinery ceases to operate at 30 mgd once-through non-contact cooling water. Since the FSR will evaluate the full range of alternatives that will correspond to the full range of risk management decisions, ExxonMobil will proceed with a Feasibility Study (FS) in parallel with finalizing the RERAR. The NJDEP concurred with this approach during the December 10, 2020 meeting.
4. Petroleum-related contamination, including product, has been delineated in Morses Creek sediments as presented in the ERIR completed by ExxonMobil and approved by the Department on May 23, 2014. Additional data gaps that may need to be addressed will be included in the Feasibility Study Work Plan (FSWP) and subsequent FS. The FSWP will also address NJDEP's comments to the 2014 Final ERIR.

These general points are important in understanding the context of our responses to the comments raised by the Department below. While the revised RERAR will address the Department's comments, we emphasize that the RERAR will be based on current conditions affected by multiple stressors, including ongoing discharges. The FSR that will be completed concurrently will evaluate potential future remedial action alternatives for Morses Creek.

The following are responses to General and Specific comments raised by the NJDEP on the RERAR document.

## **General Comment**

### **Comment 1:**

*The Department understands that the Ecological Exposure Zones (EEZs) were developed and are described in previous reports. The ecological forage areas for many of the receptors being modeled would be exposed to several EEZs. EEZ 7 and 8 (8a and 8b) are adjacent to each other and the risk assessments are performed individually. EEZ 8 is subdivided into 8a, 8b, and 8c, which are not continuous, and risk assessment is performed as one EEZ. Please clarify the rationale for different assessment approaches.*

### **Response to General Comment:**

The approach to date of focusing on EEZs is being transitioned to an approach based on IAOCs since EEZs themselves have no regulatory significance and it is the IAOCs that are eventually closed out. The EEZs referenced in the RERAR (EEZs 1, 2, 7, 8, 10, and 14) will be addressed within future ERA reports is presented below:

- EEZs 1 and 2 will be presented in a revised Moses Creek ERAR.
- EEZs 7, 8, and 10 will be presented in an ERAR addressing IAOCs B1, B2, B3, and C4 which are generally contiguous.
- EEZ 14 will be incorporated into the IAOC E1 ERAR because it is contiguous with that area and its associated EEZs (3, 15, 24b, 24c, and 24d).

This regrouping should address the questions the Department may have had about fragmentation in the ERA approach.

## **Specific Comments**

### **Comment 2:**

*Section 3.1, Contaminants of Potential Ecological Concern (page 19): The report states, "EPH and SPM are not considered COPECs." Please remove this statement from the text, because of the following. It is clearly documented that the EPH and SPM investigation will be provided in a different report, but the NJDEP never indicated that EPH and SPM are not considered COPECs. The presence of EPH in sediments is assessed in a line of evidence, approached with visual, olfactory and PID readings. The presence of product in sediments could have significant ecological impacts in the ecological communities.*

### **Response to Comment 2:**

The sentence will be deleted from the revised ERAR for Moses Creek.

As discussed in our December 10, 2020 meeting, the 2014 ERIR delineated product in Moses Creek using the above approach as well as using laser induced fluorescence investigation (LIF) using the TarGOST techniques. The RERAR will be revised to incorporate discussion of product in sediment and will cross-reference the FSR, which will include detailed evaluation of the full range of remedial action alternatives for addressing product in sediment.

### **Comment 3:**

*Section 5.3.2, Potential Exposure Pathways and Populations (page 34 & 35) and Exposure and Appendix CI ECSM diagram (e-page 1030): The ecological conceptual site model and ECSM diagram do not mention groundwater as a potentially impacted media and transport/exposure mechanism. Please address this topic in the text and if appropriate update the ECSM diagram.*

**Response to Comment 3:**

Comment noted. The ECSM diagram will be included to reflect potential groundwater inputs to surface water where appropriate in each of the ERA reports. A verbal summary of the groundwater/surface water interactions will also be included in each ERA report.

**Comment 4:**

*Section 6.4.2, 2018 Sediment Toxicity Testing Study Design (Page 48): The sediment toxicity testing used three different water sources: Morses Creek (BW-MC-1), Elizabeth River (BW-ER-1) and artificial saltwater (ASW) from the lab. The 2016 sediment toxicity testing methods did not expose the *Leptocheirus plumulosus* amphipods to Elizabeth River sediment with Morses Creek water. The Elizabeth River samples (ER-1 through ER-3) used ASW and site water. The *L. plumulosus* amphipods were exposed to different water temperatures in the 2016 Sediment Toxicity Testing, but not in the 2018 testing. Please address the different methodology for the Sediment toxicity studies and clarify the benefits of Morses Creek water with Elizabeth River sediments (ER-1 through ER-5).*

**Response to Comment 4:**

The 28-day tests, their execution, results and findings have been the subject of numerous discussions between ExxonMobil and the Department. Continued focus on the study details is not warranted, given that the impacted nature of Morses Creek as part of an active facility with legacy petroleum contamination has already been acknowledged and EM is required to prepare an FSR to address it.

For the purposes of finalizing the RERAR, we note that the 28-day test is only one measurement endpoint evaluated. The toxicity testing results in conjunction with other endpoints: food chain modeling, benthic macroinvertebrate community structure and presence of product in sediments will be discussed in the final RERAR report which will identify current risks and addressed in the FSR which will evaluate future remedial action alternatives that are deferred.

**Comment 5:**

*Section 7.2.2, 2018 Reference Area Sampling (Page 52): The ecological screening criteria being used in table titled Summary of Reference Area Sediment Constituents > Ecological Screening Criteria are not the same as used in Table II (e-page 634). For example: 4,4'-DDD is showing an ESC ER-L of 4,000 and being compared with a mean concentration of 1,254.4, while Table II shows a maximum concentration of 0.0093 in ER-3 (2018 sampling). The units are not reported on the corresponding tables. Please include units in all of the tables, compare all data to the NJDEP Ecological Screening Criteria and verify that data for COPECs are correct.*

**Response to Comment 5:**

As requested, ExxonMobil will review the table and include a revised version in the Morses Creek ERAR.

**Comment 6:**

*Section 7.4, Biota: Please clarify why only a single crab sample was collected in EEZ-7. If there were unsuccessful attempts to collect more specimens, then please include this information in the report.*

**Response to Comment 6:**

A single crab sample was likely a result of low catch success. During the ERA for B1, B2, B3, and C4, ExxonMobil will attempt to collect two more crabs from EEZ 7.

**Comment 7:**

*Section 8.1.1, Exposure Modeling (page 61): The receptor's diet percentages, shown in Table VII (e-page 975), account for different sources, i.e.: fish, crabs, annelids, mollusks, insects and mice. The raccoon exposure modeling calculated ingestion rates for fish and crabs (page 61), based on the total ingestion rate, taking into consideration the percentages of diet sources. The average daily dose calculations need to account for 100 percent of the receptor's diet. Please specify the percentages used to develop the crab and fish ingestion rates.*

**Response to Comment 7**

The dietary percentages assumed will be documented in the forthcoming ERARs. Food chain modeling will be revised to be consistent with other risk assessment work in progress (e.g. IAOC E1 terrestrial and aquatic and IAOC C1, C2, and C3 terrestrial and aquatic) reflecting ongoing discussions with NJDEP BEERA.

**Comment 8:**

*Section 10.2, Conclusions (page 85) and Executive Summary -- Findings and Conclusions (Page 8): The report states, "The high percentage of fine-grained material in the soil and sediments may be used as a basis to support an alternative EPH product determination for site sediments and soils pursuant to previous correspondence with the NJDEP; as noted in RTC, This will be subject of future reports." The alternative EPH product determination, based on fine-grained material, is for soils only in non-ESNRs. In sediments, EPH is assessed by multiple lines of evidence, visual, olfactory, PID reading, staining, etc. If sheen is present, it will need to be delineated and remediated to protect the ecological communities. The EPH ecological screening criterion for soil is 1,700 mg EPH/ kg and the maximum soil ecological remediation goal has been set at 4,000 mg EPH/ kg.*

**Response to Comment 8:**

In the ERARs that address soil, for the purposes of risk management decisions, ExxonMobil will continue to compare concentrations to the EPH ecological screening criterion of 1,700 mg EPH/ kg and the maximum soil ecological remediation goal of 4,000 mg EPH/ kg.

In the ERARs that address sediment, as discussed in our December 10, 2020, the product in EEZs 1 and 2 was delineated as reported in the ERIR (2014). ExxonMobil delineated product using multiple lines of evidence (*visual, olfactory, PID reading, staining, sheen*) as well as TarGOST results along transects. Appendix B of that report consists of the Anchor QEA report that presented analysis of TarGOST laser induced fluorescence (LIF) of sediment profiles with depth over the entire extent of Moses Creek. As the product was delineated within the ERIR and subsequently approved by NJDEP (except for the one additional transect requested further east of HSD Q-1 and HSD Q-2 that will be addressed in the FS) further delineation of sheen is not necessary. Sediment in other EEZs will continue to be evaluated using a similar weight-of-evidence approach, although LIF may not be necessary for vertical delineation where sediment depths are shallow.

**Comment 9:**

*Section 10.2, Conclusions (page 85): The Department disagrees with the following statement, "ExxonMobil maintains that no unacceptable risk to upper trophic level species is indicated by the ERA, RMDs are unnecessary, and no further ecological risk evaluation is warranted for EEZs 1, 2, 7, 8, 10 and 14." Based on the hazard quotients above one, there is potential risk that needs to be managed. The elevated HQ results demonstrate that Ecological Risk-Based Remediation Goals and Risk Management Considerations need to be developed to make Risk Management Decision for the site. The Departments comments in this letter need to be addressed and the HQ re-calculation is needed prior to making a management decision.*

**Response to Comment 9:**

Comment noted. The hazard quotients will be re-calculated with the agreed-upon inputs and the assumptions and conclusions will be revised as appropriate. If results show risks to target receptors that warrant remediation, preliminary remedial goals would be calculated for COPECs driving risk. ExxonMobil plans to continue coordination with the BEERA staff on issues pertinent to modeling and interpretation of results prior to finalizing ERAR documents.

**Comment 10:**

*Table IX and Table X, Literature Derived LOAELs and NOAELs: When using tier II TRVs from the USEPA Ecological Soil Screening Levels for Lead (Eco SSL), the NOAEL selected for the Eco SSL should be chosen for site-specific TRV. The NOAELs from reviewed studies listed in the document are not acceptable without submitting alternative TRV justification requirements. In addition, the Eco SSL does not select LOAELs, but it is considered acceptable to select the LOAEL from the chosen bounded study corresponding to the selected NOAEL (TRV). For example, EPA selected the avian lead NOAEL of 1.63 mg/kg BW/day from Edens and Garlich (1983) bounded-study, shown below in table 1. The corresponding LOAEL is 3.26 mg/kg BW/day. The LOAEL used in the HQ calculation and listed in Table IX is 48.1 mg/kg BW/day (an excerpt is shown in Table 2). The LOAEL selected in the RERA is not mentioned in the Eco SSL. In addition, the test species and the form do not match the Edens and Garlich (1983) bounded study. Please re-assess Tables IX and X selection of NOAELs and LOAELs and revise where necessary to the adequate TRVs; especially in the following COPECs: copper, lead, LMW PAH (avian), HMW PAH. If a Tier 3 TRV is selected, submit the necessary information described in the policy referenced above. Please make sure the TRVs meet the Alternate TRV Justification Requirement Policy.*

**Response to Comment 10:**

ExxonMobil will revise the food chain modeling to reflect the TRV guidance document and other agreements during recent conversations regarding food chain modeling inputs. LOAEL and NOAEL values as well as other inputs used in the 2019 TRC RERAR will be reassessed.

**Comment 11:**

*Appendix H-1, Hazard Quotient Summary Table: EEZ 1, 2, 7, 8 and 10 are showing elevated hazard quotients (HQ) for at least one COPEC in conservative scenario (95% UCL and NOAEL) and alternative scenario (95% UCL and LOAEL). The HQ results clearly indicate unacceptable risk to receptors (i.e.: spotted sandpiper and raccoon) using the current HQ values. The HQ values will change and potentially increase in several COPECs, once the toxicity reference values (TRVs) are revised. EEZ 14 should be re-evaluated if the HQs start to show a risk.*

**Response to Comment 11:**

The hazard quotient modeling will be revised, as discussed in the response to Comment 10 above. Nearly six years has passed since the original risk assessment was initiated, so reevaluation of risk assessment inputs and assumptions is warranted. Four scenarios (Maximum/NOAEL, 95%UCL/NOAEL, 95%UCL/LOAEL, and Mean/LOAEL) will be evaluated, consistent with recently completed draft ERA data summary reports on other IAOCs.

**Comment 12:**

*ERA Objective and Approach (page 11): The report states: "The Conservative scenarios used the maximum, 95% UCL, and mean concentrations of COPECs in biota and environmental media. The Alternative scenarios used the alternative 95% UCL and alternative mean concentrations of COPECs in biota and environmental media." Page 69 describes the two types of 95% UCLs used in calculations:*

- a. Conservative 95% UCL uses 95% of the mean COPEC concentrations in environmental media and biota. Where insufficient sample numbers prevented calculation of COPEC 95% UCL, the maximum detected COPEC concentrations were substituted in the appropriate models.*
- b. Alternative 95% UCL uses 95% of the mean of COPEC in environmental media and biota.*

*The 95% UCL requires a minimum number of unique sample results in the calculation. Where a 95% UCL cannot be calculated due to too few sample results, then the maximum value should be used.*

**Response to Comment 12:**

Comment acknowledged.

**Comment 13:**

*8.1.2 TRV selection (page 65): The report states, "it should be noted that the tier I TRV for the HMW PAHs was not used in the HQ calculations, since the source document was rejected by the USEPA in its ECO SSL 2005 document, and it was based on a study using non-oral dosing of test species (inter-peritoneal injection). The basis for selecting the remaining TRVs (Tier II or Tier III) include their development using test species more akin to those likely foraging at the Site (e.g. aquatic avian species in lieu of domestic poultry), if the administration of the chemical tested was administered orally, and/or if they were not rejected by the USEPA." The TRVs selected in our Ecological Evaluation Technical Guidance were vetted by multi-agencies, including the USEPA. It is the approved TRV in the Passaic River Focused Feasibility Study, an EPA Superfund site. The Department supports the use of these TRVs. If the tier I or tier II TRVs are not used or are not available, a tier III TRV may be proposed with the submittal of requirements outlined in the Alternate TRV Justification Requirement Policy.*

**Response to Comment 13:**

The Department and ExxonMobil have since reached agreement on TRVs and most of the hazard model inputs required for this site. Use of TRVs other than Tier 1 have been discussed and agreed to in advance and this approach will be continued.

## **Additional Comments**

### **Additional Comment 14:**

*The report referenced the NJDEP comment email sent to ExxonMobil and incorrectly dated as April 13, 2017. NJDEP comment email was sent on June 28, 2017. The date should be corrected throughout the document. Some example pages where the Department identified this error are: 1, 17, 22, 28, 43, 77 and 87.*

### **Additional Comment 15:**

*Executive Summary, Second Paragraph (e-page 14): Please correct John Ruhl's name. The document has Jonathan Ruhl.*

### **Additional Comment 16:**

*Executive Summary, second bullet, third sub-bullet (e-page 14): The report states, "Sediment sampling and analysis (pbayybber approved SSAWP)". Please correct the statement indicating who approved the SSAWP, as it appears to be a typo.*

### **Additional Comment 17:**

*Please include the USEPA Ecological Soil Screening Levels (2005) in the reference section of the document.*

### **Additional Comment 18:**

*Section 7.4 Biota: Summary of the biota samples — Footnotes 1 and 2 are missing from the table. Footnote 2 may need to be revised to indicate 57 crab samples were collected, instead of 56. The single crab in EEZ-7 needs to be included.*

### **Additional Comment 19:**

*USEPA and Department Comment to Response 25 in Appendix A: USEPA and the Department are recommending that the results of this Revised ERAR be used by the property owner/refinery operator when the NJPDES permit is up for renewal to reduce permitted levels of COPECs, especially lead and mercury, since they are found in environmental media and biota in Morses Creek.*

### **Response to Comments 14 through 19:**

Comments acknowledged.

### **Additional Comment 20:**

*USEPA and Department Comment to Response 27 in Appendix A: Section 8 of the RERAR does not include any other HQ results than the Alternative mean ones. In order to reflect what would be included in a USEPA-prepared ecological risk assessment report, Section 8 should contain a summary of the HQ results equal to or greater than 1.0 for all receptors at all the EEZs for the Alternative 95% UCL and LOAEL scenario.*

### **Response to Comment 20:**

A summary table will be provided for all four scenarios (Maximum/NOAEL, 95%UCL/NOAEL, 95%UCL/LOAEL, and Mean/LOAEL), consistent with what was provided in the Data Summary Reports for ERAs at other IAOCs, with Department approval.



**Additional Comment 21:**

*USEPA would also like to reiterate their previous comment concerning potential future EPH removal efforts. If elevated concentrations of EPH are proposed for removal, the Feasibility Study Report should include figures showing the proposed areas of EPH remediation along with the locations of the maximum concentrations of the sediment COPECs, especially DDD, DDE, DDT, lead, mercury, and selenium. If these areas are co-located, this could demonstrate that the areas proposed for EPH remediation also contain the areas of highest concentration of the COPECs in sediment and biota.*

**Response to Comment 21:**

Comment acknowledged.

We look forward to discussing these responses with you further.

Thank you for your continued cooperation.

Please contact me at 703-963-7132 if you have any questions.

Sincerely,



Maureen Forlenza  
Bayway Team Lead Project Manager

cc: S. Ferreira – USEPA  
D. LaMond – Phillips 66 (electronically)  
Chris McCardell – Stantec (electronically)